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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND  
INTERFERENCES

In re PATENT APPLICATION of:

MANGOLD, H. *et al.*

Application Serial No: 09/632,208

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**BRIEF ON APPEAL**

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A. INTRODUCTION

This Appeal is from an official action mailed August 28, 2002 finally rejecting claims 1 to 8, 23, and 24 of the previously identified application followed by an Advisory Action mailed January 6, 2003, affirming the claim rejections.

1. Real Party in Interest

The real party of interest for this Appeal and the present application is Degussa AG, as evidenced by the assignment recorded at the United States Patent and Trademark Office on October 6, 2001 on Reel 012322, Frame 0909.

2. Related Appeals and Interferences

The appellant, appellant's legal representatives, or the assignee are not aware of any related appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

3. Status of Claims

Claims 1 to 8, 23, and 24 are pending, stand rejected, and are on appeal. Claims 9 to 14 were withdrawn and claims 15 to 22 were cancelled. The claims on appeal are set forth in the attached Appendix. Claim 1 is independent; claims 2 to 8 individually depend from claim 1; claim 23 depends from claim 2; claim 24 depends from claim 3.

4. Status of Amendments

Subsequent to the final rejection a response was submitted on December 26, 2002, which resulted in the Advisory Action of January 6, 2003 that affirmed the claim rejections.

B. SUMMARY OF THE INVENTION

1. Related Art Problems Overcome by the Invention

Silicon alkoxide solutions can be converted into gel bodies by the action of acids. These gel bodies are then dried and sintered to produce glass. In the industry, these processes are called "sol-gel processes".

Dispersions of nano-scale powders, such as pyrogenically produced silicon dioxide (silica), may also be sintered. In these processes, known as "colloidal sol-gel processes", dispersions of silica are gelled by reduction of pH to form the gel body. The gel body is dried to form a green body, which is cleaned and sintered.

In both processes, the drying and sintering steps result in shrinkage of the gel body often resulting in fine seeds, flaws, or cracks. Consequently, the glass produced from this sintered material is not of highest quality and has lower utility in high-quality optical fiber.

Gel bodies produced from colloidal sol-gel processes undergo less shrinkage than those produced from sol-gel process. This is due to the higher degree of filling by the nano-scale powders (e.g., pyrogenically-produced silica). Reduction in the amount of shrinkage correlates directly with a reduction in the number of flaws in the glass produced after the sintering step. However, even the gel bodies produced from colloidal sol-gel processes experience considerable shrinkage because limitations in the amount of filling by conventional pyrogenically-produced silica, which in turn results in the formation of less than optimum sintered material. Therefore, there is a need for sintered material that possesses better qualities, e.g., capillary and pore structure (page 1, line 17 to page 3, line 7).

## 2. Object of the Invention

It is an object of the invention to develop sintered materials with improved capillary and pore structure. The invention provides sintered materials, produced by a forming or compacting process, an optional cleaning step, and a subsequent sintering process. The pre-sintered composition includes pyrogenically produced silicon dioxide with specific properties (page 2, lines 10 to 26).

## 3. The Claimed Invention

### a) Claim 1

Independent claim 1 is directed to a sintered material produced by a forming or compacting process, an optional subsequent cleaning step, and a subsequent sintering process. The pre-sintering composition comprises either pyrogenically produced silicon dioxide which has been compacted to granulates having a tamped density of from 150 g/l to 800 g/l, a granulate particle size of from 10  $\mu\text{m}$  to 800  $\mu\text{m}$ , and a BET surface area of from 10  $\text{m}^2/\text{g}$  to 500  $\text{m}^2/\text{g}$ ; or pyrogenically produced silicon dioxide having a mean particle diameter of 25  $\mu\text{m}$  to 120  $\mu\text{m}$ , a BET surface area of 40  $\text{m}^2/\text{g}$  to 400  $\text{m}^2/\text{g}$ , pore volume of 0.5 ml/g to 2.5 ml/g, no pores smaller than 5 nm, i.e., only meso- and macro-pores are present, a pH value of 3.6 to 8.5, and tamped density of 220 g/l to 700 g/l.

b) Claim 2

Additional features of the invention are found in dependent claim 2. Claim 2 is dependent on claim 1 and is directed to a process for converting granulates to sintered material. The process comprises the following steps:

- 1) preparing a dispersion of granulates having a solids content of from 10 wt.% to 85 wt.%, and a polar or non-polar inorganic or organic liquid,
- 2) transferring the dispersion into a form or coating of surfaces with the dispersion,
- 3) initiating gelling of the dispersion and drying of a gel body or gel body coating and drying the gel body or gel body coating to form a green body or green body coating;
- 4) optionally cleaning the green body obtained after the drying operation, or the green body coating, with gaseous substances, at temperatures of from 700°C to 1000°C, and
- 5) sintering at a temperature of from 1000°C to 1800°C, such that the resulting sintered body or sintered surface is fully dense-sintered or is still partially porous.

c) Claim 3

Additional features of the invention are found in dependent claim 3. Claim 3 is dependent on claim 1 and is directed to a process for converting granulates to sintered material. The process comprises the following steps:

- 1) introducing the granulates, without aid of a liquid, into a form or application of the granulates to a surface, to provide a formed body or a layer,
- 2) optionally, further compacting, the formed body or layer such that the formed body or layer is pressed under a high external mechanical pressure at either atmospheric pressure or reduced pressure. The formed body or the compacted coating obtained after the pressing step can optionally be cleaned with gaseous substances, at temperatures of from 700°C to 1000°C, and then sintered at a temperature of from 1000°C to 1800°C, such that the resulting sintered body or sintered surface is fully dense-sintered or is still partially porous.

d) Claim 4

Additional features of the invention are found in dependent claim 4. Claim 4 is dependent on claim 1 and is directed to a sintered material in which the granulates are processed by applying the granulates to formed bodies or surfaces by thermal or other high energy processes. The solid formed body or a solid coating obtained is sintered so that the resulting sintered body or sintered surface is fully dense-sintered or is still partially porous.

e) Claim 5

Additional features of the invention are found in dependent claim 5. Claim 5 is dependent on claim 1 and is directed to a sintered material, during the production of which, the granulates are brought into a form before or after heating by thermal, electric or electromagnetic energy, and are then sintered so that a resulting sintered body or sintered surface is fully dense-sintered or is still partially porous. Alternatively, the granulates are partially or completely melted and formed before or after heating to solidify in a form or as a coating, and optionally after-treated.

f) Claim 6

Additional features of the invention are found in dependent claim 6. Claim 6 is dependent on claim 1 and is directed to a sintered material that comprising a glass, which has been sintered to provide a transparent glass body or a transparent glass layer. The sintering takes place within a viscosity range of the glass from  $10^8$  dPas to  $10^{12}$  dPas.

g) Claim 7

Additional features of the invention are found in dependent claim 7. Claim 7 is dependent on claim 1 and is directed to a sintered material that comprises a glass, which is at least water-resistant according to hydrolytic class 2.

h) Claim 8

Additional features of the invention are found in dependent claim 8. Claim 8 is dependent on claim 1 and is directed to a sintered material that comprises a glass. The properties of the glass sintered or melted from corresponding very fine powder particles correspond to properties of a glass having an identical chemical composition that has been produced via a conventional melting process without using the compacted granulates. The production of the sintered material requires substantially lower sintering temperatures as compared with the melting temperature required to produce the glass having an identical composition that has been produced via the conventional melting process.

i) Claim 23

Additional features of the invention are found in dependent claim 23. Claim 23 is dependent on claim 2 and is directed to a sintered material produced by the process of claim 2. In claim 23, step 4) comprises cleaning the green body obtained after the drying operation or

the green body coating, with gaseous chlorine or thionyl at a temperature of from 700°C to 1000°C.

j) Claim 24

Additional features of the invention are found in dependent claim 24. Claim 24 is dependent on claim 3 and is directed to a sintered material produced by the process of claim 3. In claim 24, step 2) includes cleaning the formed body obtained after the pressing step or the compacted coating, with gaseous chlorine or thionyl at a temperature of from 700°C to 1000°C.

C. REJECTIONS AND ISSUES

The final official action, dated August 28, 2002, rejected claim 8 under 35 U.S.C. §112, second paragraph. The final official action also rejected claims 1 to 8, 23, and 24 under 35 U.S.C. §§102 and 103 over Kamo *et al.* (U.S. Pat. No. 5,585,173), Köppler *et al.* (U.S. Pat. No. 5,979,186), Sayce *et al.* (U.S. Pat. No. 5,985,779), Loxley *et al.* (U.S. Pat. No. 6,012,304), Bhandarkar *et al.* (U.S. Pat. No. 6,209,357), and Loxley *et al.* (U.S. Pat. No. 6,355,587).

Therefore, the issues on appeal are whether claim 8 is indefinite under 35 U.S.C. §112, second paragraph and whether claims 1 to 8, 23, and 24 are anticipated by, or in the alternative, obvious over, Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) under 35 U.S.C. §§102 and 103.

D. GROUPING OF CLAIMS

Each claim in this patent application is separately patentable and upon issuance of a patent will be entitled to a separate presumption of validity under 35 U.S.C. §282. For this appeal, the claims are grouped as follows:

Group I: Claims 1 to 8, 23, and 24

The claims within Group I do not stand or fall together and are argued separately in the following arguments.

E. ARGUMENT

1. The Law Regarding 35 U.S.C. §112, Second Paragraph

In *In re Conley, Catherwood, and Lloyd* 180 USPQ 454, 456 the Court held that "(i)f the scope of the subject matter embraced by a claim is clear, and the applicant has not



otherwise indicated that he intends the claim to be of a different scope, then the claim does particularly point out and distinctly claim the subject matter which the applicant regards as his invention.” (CCPA 1974). Furthermore, the Court in *Miles Laboratories Inc. v. Shandon Inc.* 27 USPQ2d 1123, 1126 stated that “(t)he test for definiteness is whether one skilled in the art would understand the bounds of the claim when read in light of the specification. If the claims read in light of the specification reasonably apprise those skilled in the art of the scope of the invention, §112 demands no more. The degree of precision necessary for adequate claims is a function of the nature of the subject matter” (CAFC 1993, citations omitted).

2. Rejection Under 35 U.S.C. §112, Second Paragraph

Claim 8 was rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. Claim 8 is Not Indefinite Under 35 U.S.C. §112, Second Paragraph

Claim 8 is directed to a glass sintered or melted from very fine powder particles corresponding to properties of a glass having an identical chemical composition that has been produced via a conventional melting process without using the compacted granulates. The examiner alleges that claim 8 is indefinite because “the glass used in comparison may have properties that change over time with advances in technology” (final official action mailed August 28, 2002). In maintaining the rejection, the examiner alleges “it is clear that the limitations to claim 8 fail to clearly set forth a quantitative value which meets the limitations of the claims as well as the limitation is variable. What is considered to be “conventional” at the time of filing of the application is not considered to be determined readily. What one of ordinary (*sic*) may consider to be conventional may not be conventional to another” (Advisory Action mailed January 6, 2003).

MPEP §2173.02 states that “(t)he examiner’s focus during examination of the claims for compliance with the requirement for definiteness of 35 U.S.C. 112, second paragraph is whether the claim meets the threshold requirements of clarity and precision, not whether more suitable language or modes of expression are available. (The examiner) should allow claims which define the patentable subject matter with a reasonable degree of particularity

and distinctness. Some latitude in the manner of expression and the aptness of terms should be permitted...” (emphasis in the original).

The examiner’s statement that the comparison point of claim 8 is temporal in nature and cannot be understood by one of ordinary skill in the art is incorrect. The appellants have made it abundantly clear that claim 8 refers to a comparison between a sintered material comprising a glass according to an embodiment of the present invention and a glass “having an identical composition” produced via a “conventional” melting process. A person skilled in the art would recognize that a conventional melting process refers to a process that existed at the time the application was filed and not some future developed technology. Additionally, the chemical composition of the glass material to be sintered is not in doubt (it is clearly defined in claim 1, from which claim 8 depends), as is the type of comparison to be made (the material of the present invention requires lower sintering temperatures).

The appellants respectfully submit that claim 8 meets the definiteness standard of 35 U.S.C. §112, second paragraph, and respectfully request that the Honorable Board withdraw this rejection.

4. The Law Regarding 35 U.S.C. §102

In order for a patent or printed publication to anticipate a claimed invention, all aspects of the invention must be found within the ambit of a single reference. In *Dewey & Almy Chemical Co. v. Mimex Co., Inc.* 138 USPQ 138, 142 the Court stated that “(n)o doctrine of patent law is better established than that a prior patent or other publication to be an anticipation must bear within its four corners adequate direction for the practice of the patent invalidated. If the earlier disclosure offers no more than a starting point for further experiments, if its teachings will sometimes succeed and sometimes fail, if it does not inform the art without more how to practice the new invention, it has not correspondingly enriched the store of common knowledge and is not an anticipation” (CCA 2 1942).

5. The Law Regarding 35 U.S.C. §103

In order to find obviousness or non-obviousness, the Court in *Graham v. John Deere Co. of Kansas City* 148 USPQ 459, 467 set forth three conditions, each of which must be satisfied. “Under §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in this pertinent art resolved” (US 1966).

6. Rejections Under 35 U.S.C. §§102(a), 102 (b), or 102(e)

Claims 1 to 8, 23, and 24 were rejected under 35 U.S.C. §102(a), or 35 U.S.C. §102(b), or 35 U.S.C. §102(e) as allegedly being anticipated by Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) each taken independently.

7. Rejections Under 35 U.S.C. §103(a)

Claims 1 to 8, 23, and 24 were rejected under 35 U.S.C. §103(a) as allegedly being obvious over Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) each taken independently.

8. United States Patent and Trademark Office Procedures

MPEP §706 states that “(t)he goal of an examination is to clearly articulate any rejection early in the prosecution process so that the applicant has the opportunity to evidence of patentability and otherwise reply completely at the earliest opportunity” (emphasis added). Furthermore, the burden of presenting a *prima facie* case of unpatentability rests with the PTO, *In re Piasecki*, 223 USPQ 785, 788. “If examination ... does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to grant of the patent” *In re Oetiker*, 24 USPQ 2d. 1443, 1444 (CAFC 1992).

In the official actions, the examiner has set forth a series of blanket rejections, which in no way clearly articulate the rejections, nor establish a *prima facie* case of unpatentability. By the manner in which the examiner has drafted the official actions, it is not even clear which section of 35 U.S.C. §102 is directed to which reference. The examiner has merely provided a list of patents with vaguely similar subject matter. A mere patent search, without a detailed examination, does not fulfill the obligation of the examiner to issue official actions on the merits of the appellants' application for patent (35 U.S.C. §§ 131 and 132).

Furthermore, there is also no evidence that the examiner thoroughly considered the appellants' arguments in order to subsequently established a *prima facie* case of unpatentability as required by the Court in *In re Rinehart*, 189 USPQ 143, 154 (CCPA 1976). In the absence of a *prima facie* case of unpatentability, the appellants are not required to demonstrate that their products are different from those produced by any or all the cited patents.

The examiner's reply to the appellants' remarks in filed amendments and responses is to state that "(a)pplicants have not distinguished the claimed sintered material from the sintered material from the prior art", to cite MPEP §2113, and to cite *In re Thorpe*, 227 USPQ 964, 966 (CAFC 1985). The appellants rebut these three points in turn.

First, and contrary to the examiner's contention, the appellants twice distinguished the claimed material from the prior art – in responses to the first and final official actions. In both instances, the examiner did not substantially clarify his rejections by pointing to specific instances in the cited references that allegedly teach the limitations of claim 1.

Second, MPEP §2113 states that "(o)nce the examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to the applicant to come forward with establishing an unobvious difference between the claimed product and the prior art product." However, as shown below, the claimed pre-sintered mixture properties are unique, specific, and do not even appear to be the same, or similar, to the prior art. Therefore, the burden has not shifted to the appellants.

Third, *In re Thorpe*, 227 USPQ at 966 relates to whether the burden of proof rests with the applicant or the PTO, once the examiner has made a *prima facie* case of unpatentability. In addition to failing to point out specific instances when the cited patents render claim 1 unpatentable, the examiner did not even follow the basic factual inquiries for determination of obviousness under 35 U.S.C. §103 set forth in *Graham v. John Deere of Kansas City* 148 USPQ at 467 (US 1966). In particular, there is no indication that the examiner determined the scope and content of the prior art or ascertained the differences between the prior art and the claims at issue (in this case, claim 1). Therefore, the examiner cannot have initially established a *prima facie* case of unpatentability, *In re Thorpe*, 227 USPQ at 966 is not relevant, and once again, the burden cannot shift, and indeed has not shifted, to the appellants.

Notwithstanding the absence of a *prima facie* case of unpatentability and the lack of burden on the appellants to demonstrate their products are different, the appellants reiterate their prior arguments to further establish that the patents listed by the examiner do not anticipate or render obvious the claims of the present invention.

9. Claim 1 is Patentable Under 35 U.S.C. §§102 and 103

a) Kamo *et al.*

This patent is directed to high-purity opaque quartz glass. The glass is produced by compacting amorphous silica powder with an average particle size of 0.5  $\mu\text{m}$  to 10  $\mu\text{m}$  and sintering the resultant green body at 1730°C to 1850°C (see column 2, lines 59 to 64). The glass produced has  $3 \times 10^6$  to  $9 \times 10^6$  closed cells having an average size of 20  $\mu\text{m}$  to 40  $\mu\text{m}$  (see column 3, lines 49 to 51). When the amorphous silica powder has an average particle size of more than 10  $\mu\text{m}$ , the cells have an average size of over 40  $\mu\text{m}$ , and the number of cells is insufficient (see, column 4, lines 52 to 56).

In contrast, claim 1 is drawn to a sintered material produced *inter alia* from either pyrogenically produced silicon dioxide compacted to granulates having a granulate particle size of from 10  $\mu\text{m}$  to 800  $\mu\text{m}$ , or pyrogenically produced silicon dioxide having a mean particle diameter of 25  $\mu\text{m}$  to 120  $\mu\text{m}$ . Not only do Kamo *et al.* fail to disclose particles of size greater than 10  $\mu\text{m}$ , but the disclosure clearly teaches away from particles of size greater than 10  $\mu\text{m}$  (since the cells will have an average size of over 40  $\mu\text{m}$  and the number of cells will be insufficient). Therefore Kamo *et al.* cannot anticipate claim 1 nor provide any motivation for one skilled in the art to modify the disclosure of the patent to the sintered material of claim 1.

b) Köppler *et al.*

This patent is directed to the manufacture of granular silica material which is characterized by being homogeneous, compact granular material with high purity and essentially consisting of spherical particles of uniform morphology (see column 2, lines 3 to 6). The granular silica material is formed from a dispersion of solid  $\text{SiO}_2$  particles of mean size between  $10^{-3}$   $\mu\text{m}$  (1 nm) to 1  $\mu\text{m}$  (1000 nm) (see column 1, lines 29 to 32). There is no teaching or suggestion that the granular material is subjected to a forming or compacting procedure such that a tamped density of from 150 g/l to 800 g/l in one embodiment or from 220 to 700 g/l in a second embodiment, will be obtained, as in claim 1. The density of the granules in Köppler *et al.* is approximately 1000 g/l (1 g/cm<sup>3</sup>) (see column 6, lines 22 to 23), in contrast to a maximum density of 800 g/l in the present invention.

Therefore Köppler *et al.* cannot properly anticipate the present claims. In addition, Köppler *et al.* do not provide any motivation for one skilled in the art to modify the patent to

subject the granular material to a forming or compacting procedure (which is one limitation of claim 1). Consequently, the present claims are patentable over Köppler *et al.*

c) Sayce *et al.*

This patent is directed to opaque quartz glass of enhanced opacity and produced by fusion of silica particles to restrict transmission of infra-red radiation. The present invention, as represented by claim 1, is directed to a material for the production of transparent glass for high-quality optical fiber (see, for example, page 5, lines 14 to 16). Sayce *et al.* also disclose the incorporation of a large number of small bubbles in transparent glass (see column 1, lines 28 to 30). This disclosure is diametrically opposed to the present invention, which among other advantages, seeks to decrease seeds, cracks, and flaws in the glass, thereby increasing transparency and optical transmission (see, for example, page 2, lines 8 to 12).

Sayce *et al.* produce opaque glass by mixing an organosilicon compound to the feedstock material (see column 2, lines 38 to 39). This patent does not anticipate a sintered material, produced by a forming or compacting process and comprising pyrogenically produced silicon dioxide which has been compacted to granulates or compacted pyrogenically produced silicon dioxide having the specific properties listed in claim 1.

Furthermore, as it is directed to increasing the quality of opaque glass by the addition of organosilicon compounds, Sayce *et al.* teach away from the present invention. A person skilled in the art would not look to modify the disclosure of Sayce *et al.* to produce the sintered material of claims 1.

d) Loxley *et al.* ('304)

This patent is directed to sintered quartz glass products and methods of manufacture. High-purity quartz glass can be obtained by incorporating minute amounts of chemically-bonded nitrogen in the silica (column 7, lines 60 to 63). The silica is then sintered to produce glass. Loxley *et al.* ('304) disclose the use of silica particles of average size between 2  $\mu\text{m}$  and 10  $\mu\text{m}$  (column 15, lines 61 to 62). Therefore, Loxley *et al.* ('304) do not anticipate claim 1 of the present invention, which is directed to a sintered material produced by a forming or compacting process, an optional subsequent cleaning step, and a subsequent sintering process using a pre-sintering composition of granulate particle size of 10  $\mu\text{m}$  and greater. In addition, other specific properties and limitation of claim 1 are not disclosed in Loxley *et al.* ('304), e.g., BET surface area, pore volume, pH, and tamped density.

In addition, claim 1 is not obvious over Loxley *et al.* ('304) because Loxley *et al.* ('304) is directed to a sintered transparent quartz glass with a minimal bubble content, i.e., no more than a small number of visible bubbles (less than one per square inch), an average bubble size of less than 6  $\mu\text{m}$ , and substantially free of large voids or bubbles with a diameter of 200  $\mu\text{m}$  or more (column 15, lines 18 to 26). It is well known in the art that sintering particle of smaller sizes leads to glass with higher transparency (i.e., lower bubble content), *vide supra*. In other words, Loxley *et al.* ('304) provides no motivation for one of ordinary skill in the art to use larger particle sizes, as in the present invention, especially in light of the disclosure in Loxley *et al.* ('304) of particle sizes no greater than 10  $\mu\text{m}$ .

Accordingly, claim 1 is neither anticipated by nor obvious in view of Loxley *et al.* ('304).

e) Bhandarkar *et al.*

This patent is directed to a method for forming silica bodies useful for an optical fiber preform, using a sol-gel process. A precipitation process is employed in which silica precipitates at the contact sites of adjacent silica particles. The gelling is required to be initiated at a pH of 10.5 or greater (column 3, lines 14 to 16). In contrast, the pH range in claim 1 is 3.6 to 8.5, and tamped density of 220 g/l to 700 g/l. Furthermore, other specific limitations and properties in claim 1, e.g., compacting, pore volume and tamped density, are not disclosed. Therefore, Bhandarkar *et al.* cannot anticipate claim 1.

Additionally, as Bhandarkar *et al.* direct one of ordinary skill in the art to silica with a pH range of 10.5 and higher (with additional advantages the higher the pH), they teach away from lower pH ranges. Specifically, Bhandarkar *et al.* do not provide any motivation for one of ordinary skill in the art to select a pH range of 3.6 to 8.5, as in claim 1. Therefore, Bhandarkar *et al.* cannot render obvious the subject matter of claim 1.

f) Loxley *et al.* ('587)

Loxley *et al.* ('587) is a continuation of Loxley *et al.* ('304) and does not disclose any additional subject matter over Loxley *et al.* ('304) that would either anticipate, or render obvious, claim 1 of the present invention. Therefore, claim 1 is patentable over Loxley *et al.* ('587) for at least the same reasons as provided for Loxley *et al.* ('304).

The appellants have shown specific instances where the cited patents do not anticipate, or render obvious, the limitations of claim 1. In contrast, in no instance has the examiner

pointed to specific teachings in the patents that either anticipate, or render obvious, the limitations of claim 1.

Therefore, the appellants respectfully submit that claim 1 is patentable under 35 U.S.C. §§102 and 103 over Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) and respectfully request that the Honorable Board withdraw this rejection.

10. Claim 2 is Patentable Under 35 U.S.C. §§102 and 103

The appellants respectfully submit that claim 2 is patentable under 35 U.S.C. §§102 and 103 over Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) for at least the reasons given above for claim 1 and for additional limitations and features in claim 2.

None of the cited patents teach, or suggest, *inter alia* the preparation of granulates having a solids content of 10 wt.% to 85 wt.%, optionally cleaning the green body with gaseous substances at temperatures from 700°C to 1000°C, and sintering at a temperature between 1000°C and 1800°C.

11. Claim 3 is Patentable Under 35 U.S.C. §§102 and 103

The appellants respectfully submit that claim 3 is patentable under 35 U.S.C. §§102 and 103 over Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) for at least the reasons given above for claim 1 and for additional limitations and features in claim 3.

None of the cited patents teach, or suggest, *inter alia* optionally further compacting the formed body or layer at high external mechanical pressure, atmospheric pressure, or reduced pressure, optionally cleaning the green body with gaseous substances at temperatures from 700°C to 1000°C, and sintering at a temperature between 1000°C and 1800°C.

12. Claim 4 is Patentable Under 35 U.S.C. §§102 and 103

The appellants respectfully submit that claim 4 is patentable under 35 U.S.C. §§102 and 103 over Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) for at least the reasons given above for claim 1 and for additional limitations and features in claim 4.

None of the cited patents teach, or suggest, *inter alia* applying the granulates to formed bodies or surfaces by thermal or other high energy processes.



13. Claim 5 is Patentable Under 35 U.S.C. §§102 and 103

The appellants respectfully submit that claim 5 is patentable under 35 U.S.C. §§102 and 103 over Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) for at least the reasons given above for claim 1 and for additional limitations and features in claim 5.

None of the cited patents teach, or suggest, *inter alia* a sintered material, during the production of which, the granulates are brought into a form before or after heating by thermal, electric or electromagnetic energy, and are then sintered so that a resulting sintered body or sintered surface is fully dense-sintered or is still partially porous. Alternatively, the granulates are partially or completely melted and formed before or after heating to solidify in a form or as a coating, and optionally after-treated.

14. Claim 6 is Patentable Under 35 U.S.C. §§102 and 103

The appellants respectfully submit that claim 6 is patentable under 35 U.S.C. §§102 and 103 over Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) for at least the reasons given above for claim 1 and for additional limitations and features in claim 6.

None of the cited patents teach, or suggest, *inter alia* a sintered material where the sintering takes place within a viscosity range between  $10^8$  dPas to  $10^{12}$  dPas.

15. Claim 7 is Patentable Under 35 U.S.C. §§102 and 103

The appellants respectfully submit that claim 7 is patentable under 35 U.S.C. §§102 and 103 over Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) for at least the reasons given above for claim 1 and for additional limitations and features in claim 7.

None of the cited patents teach, or suggest, *inter alia* a sintered material further comprising a glass that is water-resistant to hydrolytic class 2.

16. Claim 8 is Patentable Under 35 U.S.C. §§102 and 103

The appellants respectfully submit that claim 8 is patentable under 35 U.S.C. §§102 and 103 over Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) for at least the reasons given above for claim 1 and for additional limitations and features in claim 8.

None of the cited patents teach, or suggest, *inter alia* a sintered material that requires substantially lower temperature to produce a glass that has the identical composition of a glass produced via the conventional melting process.

17. Claim 23 is Patentable Under 35 U.S.C. §§102 and 103

The appellants respectfully submit that claim 24 is patentable under 35 U.S.C. §§102 and 103 over Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) the cited patents for at least the reasons given above for claim 1 and for additional limitations and features in claim 24.

None of the cited patents teach, or suggest, *inter alia* cleaning the green body or the green body coating, obtained after drying, with gaseous chlorine or thionyl chloride at a temperature between 700°C and 1000°C.

18. Claim 24 is Patentable Under 35 U.S.C. §§102 and 103

The appellants respectfully submit that claim 24 is patentable under 35 U.S.C. §§102 and 103 over Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) the cited patents for at least the reasons given above for claim 1 and for additional limitations and features in claim 24.

None of the cited patents teach, or suggest, *inter alia* cleaning the green body or the green body coating, obtained after pressing, with gaseous chlorine or thionyl chloride at a temperature between 700°C and 1000°C.


Inventor(s): MANGOLD *et al.*  
Application No.: 09/632,208  
Attorney Docket No.: 021123-0271764


F. CONCLUSION

For the reasons discussed above, the appellants respectfully submit that claim 8 is not indefinite under 35 U.S.C. §112, second paragraph and claims 1 to 8, 23, and 24 are neither anticipated by, nor obvious over, Kamo *et al.*, Köppler *et al.*, Sayce *et al.*, Loxley *et al.* ('304), Bhandarkar *et al.*, and Loxley *et al.* ('587) under 35 U.S.C. §§102 and 103. The appellants respectfully request the Honorable Board to reverse the rejection of these claims.

Respectfully submitted,

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## G. APPENDIX

Claims 1 to 8, 23, and 24 are pending as follows:

1. A sintered material, produced by means of a forming or compacting process, optionally a subsequent cleaning step and a subsequent sintering process, comprising as a pre-sintering composition:

a) pyrogenically produced silicon dioxide which has been compacted to granulates having a tamped density of from 150 g/l to 800 g/l, a granulate particle size of from 10 to 800  $\mu\text{m}$  and a BET surface area of from 10 to 500  $\text{m}^2/\text{g}$ , or

b) pyrogenically produced silicon dioxide having the following physico-chemical data:

mean particle diameter: from 25 to 120  $\mu\text{m}$ ,

BET surface area: from 40 to 400  $\text{m}^2/\text{g}$ ,

pore volume: from 0.5 to 2.5 ml/g,

pore distribution: no pores < 5 nm, only meso- and macro-pores are present,

pH value: from 3.6 to 8.5,

tamped density: from 220 to 700 g/l.

2. The sintered material according to claim 1, wherein the granulates are processed to the sintered material by means of a process comprising:

a1) preparing a dispersion of granulates having a solids content of from 10 wt.% to 85 wt.%, and a polar or non-polar inorganic or organic liquid,

a2) transferring the dispersion into a form or coating of surfaces with the dispersion,

a3) initiating gelling of the dispersion and drying of a gel-body or gel-body coating and drying the gel body or gel-body coating to form a green body or green-body coating;

a4) optionally cleaning the green body obtained after the drying operation, or the green-body coating, with gaseous substances, at temperatures of from 700 to 1000°C and

a5) sintering at a temperature of from 1000 to 1800°C, wherein a resulting sintered body or sintered surface is fully dense-sintered or is still partially porous.

3. The sintered material according to claim 1, wherein the granulates are processed to the sintered material by means of a process comprising:

b1) introducing the granulates without aid of a liquid, into a form or application of the granulates to a surface, to provide a formed body or a layer,

b2) optionally, further compacting, wherein the formed body or the layer is pressed under a high external mechanical pressure at atmospheric pressure or at reduced pressure, wherein the formed body obtained after the pressing step, or the compacted coating, can optionally be cleaned with gaseous substances, at temperatures of from 700°C to 1000°C and sintered by means of a sintering step at a temperature of from 1000°C to 1800°C, wherein a resulting sintered body or sintered surface is fully dense-sintered or is still partially porous.

4. The sintered material according to claim 1, wherein the granulates are processed to the sintered material by means of a process comprising:

applying the granulates to formed bodies or surfaces by thermal or other high energy processes, in which a solid formed body or a solid coating is obtained and sintered so that the resulting sintered body or sintered surface is fully dense-sintered or is still partially porous.

5. A sintered material according to claim 1, wherein during production thereof, the granulates, by action of thermal, electric or electromagnetic energy, are brought into a form before or after heating and are then sintered so that a resulting sintered body or sintered surface is fully dense-sintered or is still partially porous, or the granulates are melted partially or completely, and formed before or after heating to solidify in a form or as a coating, and optionally after-treated.

6. A sintered material according to claim 1, comprising a glass that has been sintered to provide a transparent glass body or a transparent glass layer, wherein the sintering takes place within a viscosity range of the glass from  $10^8$  to  $10^{12}$  dPas.

7. The sintered material according to claim 1, wherein the sintered material comprises a glass that is at least water-resistant according to hydrolytic class 2.

8. The sintered material according to claim 1, wherein the sintered material comprises a glass and properties of the glass sintered or melted from corresponding very fine powder particles correspond to properties of a glass having an identical chemical composition that has been produced via a conventional melting process without using said compacted granulates, wherein production of said sintered

material requires substantially lower sintering temperatures as compared with the melting temperature required to produce the glass having an identical composition that has been produced via the conventional melting process.

23. The sintered material according to claim 2, wherein step a4) comprises cleaning the green-body obtained after the drying operation or the green-body coating, with gaseous chlorine or thionyl at a temperature of from 700°C to 1000°C.

24. The sintered material according to claim 3, wherein step b2) includes cleaning the formed body obtained after the pressing step or the compacted coating, with gaseous chlorine or thionyl at a temperature of from 700°C to 1000°C.